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Gender Equity and Environmental Health

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GENDER EQUITY AND ENVIRONMENTAL HEALTH

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June 2000

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This working paper is part of the series on "Gender and Health Equity". They arise from two workshops held at the Harvard Center for Population and Development Studies in 1997 and 1998. The workshops were organized as part of the Global Health Equity Initiative (GHEI), a comprehensive project on health equity funded in part by the Rockefeller Foundation and the Swedish International Development Agency. The GHEI is an interdisciplinary project that combines conceptual work on health equity with country-case studies. Some of the working papers within this series on Gender and Health Equity will appear jointly in a volume edited by Gita Sen, Piroska Ostlin and Asha George.

Abstract

This working paper outlines the relationship between gender and broadly defined health-and-environment issues. It shows how gender equity issues are linked to the health-and-environment domain both from the perspective of biology and of gender as a social construct, and how poverty and social roles frequently mediate environmental hazards and exposures. Special focus is given to the lack of integration, which characterizes health-and-environment problems and further hinders the incorporation of gender perspectives in national planning. A number of approaches already exist to facilitate improved integration in the area. The paper proposes that these should be further promoted and utilized, with gender criteria incorporated where these do not exist.

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Gender, Equity and Environmental Health

1. The Need for a Broader Approach to Environmental Health

Attention to securing human health and a healthy environment has grown, as governments and people alike struggle with problems of differential access to a diminishing range of environmental resources. While the environmental movement has highlighted aspects of environmental sustainability, changes in the health field have emphasized issues of social justice, equity, and human development (WHO, 1997). In this spirit significant policy commitments were made to gender, health and environment issues at global meetings since the Earth Summit in 1992.

Prior to this shift environmental health was for many decades associated with a narrow sanitary engineering approach. Characterized by pipes and pumps, sewage and garbage, norms and standards, environmental health research and policy did not lend itself well to either gender or social development perspectives. Only recently have processes of urbanization, industrialization, and globalization prioritized the need to address a broader understanding of health-and-environment issues in the context of sustainability. Within this broader understanding of the 'environment', health, social, and technical dimensions are all equally valued. Moreover, research and advocacy on women's roles and the gender division of labor, led to the recognition that women - particularly poor women in developing countries - are vulnerable to effects of environmental degradation in ways that differ from men.

However, the health sector has not in general been quick to grasp that many health and environment problems have different impacts on men and women. One reason for this is the rather belated acknowledgment by the health sector of development research and policy. Issues long debated in other disciplines are only now being "discovered" by the mainstream health sector, as the need to look beyond the curative medical approach and along the axis of preventive public health is accepted.

Despite the growing awareness of the breadth of environmental issues, it is notoriously difficult to arrive at an accurate estimate of the disease-burden of health and environment concerns. The absence of data is most stark for developing countries and for poor women. While estimates and projections abound, there has been relatively little systematic, rigorous, and clearly articulated research in this field (WHO, 1998). Reasons for this include the multiple and interconnected nature of many risks which complicates research, a general lack of data in developing countries and fragmented, discipline-oriented data in developed countries. In addition, environmental causes, except for infectious diseases and acute poisonings, are often masked in health statistics. There is, however, agreement that environmentally-related ill-health is broadly underestimated (WHO, 1996; 1997).

Apart from these data gaps, environmental health research methodology tends to privilege pathogens and pollutants while neglecting social determinants linked to poverty and gender discrimination. For these reasons it is difficult to provide scientifically acceptable causal connections in the areas of environment, poverty, and health. Linkages between gender, health and environmental factors remain elusive or often remain implicit. The acquisition of meaningful data in this area, both qualitative and quantitative, is only beginning (Sims, 1994).

Yet between one fifth and one quarter of the world's population live in absolute poverty, of which more than 90% are located in the developing world (UNCHS, 1996). Despite aggregate global indications of overall improvements in health and welfare the absolute numbers of poor throughout the world are constantly growing, and are living and working in increasingly unhealthy and unproductive environmental conditions (WHO, 1997). A principal focus of this paper is the environmental health risks and hazards facing poor communities in developing countries, where the impact of the environment on human health and of people on the environment is greatest (WHO, 1997).

While health risks are great for all within this growing number, those most disadvantaged and resource-poor are still predominantly women — particularly rural women (Jazairy et al, 1992). Unsustainability threatens the whole global system, but women feel the first and worst impacts. Women are particularly at risk because their options are doubly restricted - not only through poverty but also through their non-negotiable responsibilities. Any meaningful strategy to address environment and health issues must therefore take gender-sensitive poverty alleviation in both rural and urban settings as a central component.

2. Defining Environmental Health in Relation to Poverty and Development

Many definitions of environment in relation to health exist, ranging from the physiological perspective (dichotomizing between internal and external environment), to the more environmentalist definition (focussing on chemical, biological and physical agents). In its broadest sense environmental health is the segment of public health that is concerned with assessing, understanding, and controlling the impacts of people on their environment and the impacts of the environment on them. This paper focuses on classic environmental health, i.e. health impacts of chemical, physical and biological agents in ambient and work spaces, but from a broader perspective of resource availability and quality, gender and development. By defining environment as the geographical space sustaining but also limiting human life and health, the environment becomes both a source of hazards and resources.

Throughout history, human settlement, organization and technology served to overcome environmental constraints. Economic development in general aims to overcome local environmental resource constraints by better yielding exploitation methods. Rapid industrialization and scaling up can, however, disrupt existing social arrangements and patterns of resource exploitation. If not carefully checked and accompanied by new institutional and social arrangements, they may increase existing or introduce new inequalities at the same time as introducing a whole range of new environmental hazards. For example, dams may increase water supplies to distant urban centers or for large-scale agriculture, but they also may increase prevalence of waterborne and vector-borne diseases, exposure to pesticides, as well as result in the uprooting or loss of livelihoods of entire communities (Kettel, 1996, Sen, 1999). Frequently, decisions of those who control resources and policies affect resource accessibility and hazard characteristics of those who don't.

Traditional hazards connected with poverty and lack of development include:

- lack of access to drinking water
- inadequate basic sanitation
- microbiologically contaminated food
- indoor air pollution from biomass fuel or coal
- inadequate solid-waste disposal
- injuries from agricultural work and cottage industries
- natural disasters
- disease vectors (insects and rodents).

Modern hazards relate to rapid and unsustainable development. They include:

- food & water pollution from densely settled areas, industry, & intensive agriculture
- chronic water shortage
- ambient air pollution
- accumulation of waste
- chemical and radiation hazards
- new and re-emerging infectious diseases
- deforestation, land degradation and major ecological changes
- climate change, ozone depletion, and transboundary pollution (WHO, 1997).

In the glare of publicity surrounding modern environmental hazards, like oil spills, radiation, urban air pollution, pesticide intoxication, climate change, it is easily overlooked that many of the poor continue to struggle with basic issues like access to adequate water and sanitation, safe food, and protection from the infectious diseases. These "traditional" hazards — often associated with lack of development — are sometimes contrasted with the "modern" hazards associated with uncontrolled development patterns. The changing pattern of exposures and health risks over time, and with economic growth, is known as the "risk transition." However for the hundreds of millions confined to the poverty trap

the impact of industrialization and globalization may well be simultaneous exposure to both traditional and modern hazards — a phenomenon which has been termed the "risk overlap" (Caldwell et al, 1990; Smith, 1990).

Simultaneous exposure to both traditional and modern environmental risks in many developing countries shows that issues of concern in the North are also relevant to populations of poor countries, as the processes of globalization and unregulated industrialization proceed apace. As there are virtually no data on industrial sources of persistent toxic substances in most of the South, as well as a paucity of detailed data on pesticide use (UNEP, 1999), the following are some brief examples of the nature of problems that exist. Greenpeace carried out a sampling and analysis program in the heavily industrialized Indian province of Gujarat and found extensive surface water and groundwater pollution (Labunska et al, 1999). Industrial pollution is also found in shipbreaking in Asia. Young men, without any protection, strip asbestos coating from ships with electric drills, exposing not only themselves but the whole neighborhood to dangerous levels of asbestos, apart from other hazardous waste (Kanthak et al, 1999).

Apart from the larger, industrial sectors, workers in small enterprises also face a similar range of occupational hazards, but are further at risk by poorer access to clean workplaces, toilets and water as well as lack of occupational health services. In addition, working and living environment are within close distance, increasing the risks of non-occupational exposure and accidents. Textile-dying, car painting and repair, small metalry, pottery, shoe-making and carpentry are all examples of small industries that impose physical and chemical hazards and that are also often located within or very close to home.

A prime example of exposure to toxic pollution in today's modernizing world is small-scale agriculture. This is the major sector for employment for many of the poor and also the major producer of basic commodities for survival. Small-scale farmers typically use more pesticides and fertilizer for reasons of economic survival. They apply pesticides manually, using old and poorly maintained equipment. Consumption of small-scale sector products is risky, because of pesticide residues as well as mycotoxins from poor storage (Loewenson, 1995).

While much has been said here about chemical pollution, it should not be understood that this represents a greater health hazard than the microbiological pollution of food and water which continues to present a major public health risk to hundreds of millions. The difference is that the biology and epidemiology of microbiological contamination, as well as the necessary preventive measures are by now well known. For example, diarrhoeal diseases account for 1.5 billion bouts of illness a year among children under five, with some 2 million resulting in death (WHO, 1999). This knowledge is not adequately acted upon in the developing world where the bulk of morbidity, mortality, and lost productivity from this cause occur. In contrast, in the case of chemical pollution, science and medicine are still at the threshold of understanding the complex mechanisms and pathways through which exposure and illness occur.

Development should imply the creation of infrastructure like roads, water, electricity and sanitation and public services like transport, immunization and environmental surveillance. Following this the social construct of poverty translates into lacking the means to overcome environmental constraints and to be shielded from environmental hazards. Hence, although the poor in high income countries may be materially better off than the poor in low income countries, they both tend to lack access to public resources that should shield them from modern and traditional environmental hazards. This is particularly the case of high income countries with traditionally weak support for social policies, like the United States, but perhaps less the case of countries with stronger public infrastructure and safety nets, like in Europe.

For example, indigenous peoples in both high and low income countries face high levels of pollution, poor public infrastructure and services, while also still being highly dependent on ever diminishing

natural resources (Aldarete, 1999, WEDO, 1999, IEN/ Greenpeace, 1999). In Mexico, a study among Yaqui rural population revealed alarming rates of impaired neuromuscular and intellectual development compared to a similar community in a less contaminated area (Guillette et al, 1998). Poor people living in urban environments also face similar problems.

This predicament has led to accusations of environmental racism, proven by the empirical finding that the marginalized suffer disproportionately from environmental risks due to industrial pollution, waste dumps and occupational exposure (Bullard, 1999, Salmond et al, 1997, Clarke and Gerlak, 1998, Downey, 1998). The resulting controversy and debate about environmental racism and injustice has spread from the US to other industrialized countries and developing countries (Smith-Jr, 1997, McDonald, 1998, Salmond et al, 1999, Costi 1998) with the participation of feminists and indigenous peoples (Schneiderman, 1997, Prindeville and Bretting, 1998, Anglin, 1998, IEN/ Greenpeace 1999).

3. How Gender Matters

The greater dependence of the rural poor on natural resources due to the lack of alternatives and public infrastructure affects women disproportionately. Gender differences in time and mobility due to different roles and responsibilities greatly constrain women's economic opportunities and often lead to a high degree of dependence on locally available resources, despite their sometimes lesser quality (Butter, 1999a, WEDO, 1999). Deforestation and unsustainable use of water and marginal land further exacerbate women's heavy workloads and time constraints, as they have to walk longer distances for fuel and water (Dankelman and Davidson, 1988, Douma and Van den Hombergh, 1993, Sims, 1994, Kettel, 1996).

However even when infrastructure and services exist, they frequently do not meet women's needs. Although large amounts of money have been invested in energy production, poor women's basic fuel needs are still unmet and they continue to toil in smoke filled kitchens. Hence amongst the poor, women are the most environmentally affected by the lack of quality resources and appropriate public infrastructure. As a result, women's personal environment greatly differs from men's, which leads to different environmental hazards and different exposures.

For the poor in general, and particularly for women, the boundary between environmental and occupational health is highly permeable. This is attributable to the undervaluation of women's roles and functions and their high input to domestic or agricultural labor, often unpaid. The overlapping of risks from both inside and outside the formal sector is still under-researched, and is a disadvantage for women who face multiple and often synergistic exposures. Engberg (1993) noted that US farm work-studies often excluded women because they are categorized as unpaid labor, despite their exposure to the same risks as male agricultural workers. Women's health can suffer highly from such work exposures. A marginal farming area in Kenya shows disability levels in women aged 20-60 years approximately double those of men. Disability was greater for men only from 15-19 years and over 60 years (Sims, 1994)[1].

As women predominantly make up the membership of the poor, it can be argued that poverty as such is a gender issue. However, there are many more justifications for a gendered approach to environment and health. The health risks of poverty are generally far greater for women than for men, because for women poverty is further compounded by gender inequality. Gender discrimination is manifest in women's lack of decision-making power, the invisibility or suppression of their concerns and priorities due to biased cultural norms, their lower levels of education and lower access to health services.

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[1] Physical strain, caused by the characteristics of the marginal land coupled with the lack of equipment and infrastructure, is included in all medical definitions of environmental health. In addition, the physiological stress caused by high workloads and nutritional deficiencies increase the body's vulnerability to other environmental hazards.

Although most gender issues in environmental health are complex and highly interconnected, contributing factors can be grouped under three main categories: biology, gender division of labor and differences in power and status. From a gender equity point of view, differences in biology need to be accounted for in safety standards, work conditions and prevention. Risks derived from the gender division of labor demand more cautious interventions, in order to prevent locking women in socially defined roles. Lastly, lack of power usually translates in female invisibility and neglect of women's needs and concerns. In practice, all three factors may be present.

4. Gender Inequality Related to Biological Differences

Even though physiological stress, such as pregnancy and lactation, can affect women's capacity to deal with environmental exposure, toxicological research predominantly uses male subjects in order to avoid variation caused by the female hormonal cycle. However within reproductive health, toxicity is better researched in women than in men, though the latter also run considerable occupational risks to fertility and reproductive health (Stijkel, 1995, Colborn et al, 1996). Consequently little is known about biological differences in environmental health between men and women in areas not linked to reproductive health.

Apart from differences in hormonal status, which have hardly been researched, sex-related differences in sensitivity to toxic substances might be due to differences in detoxifying activity. Animal research indicates a five times higher detoxifying capacity in males (Hughes, 1996). The challenge in researching chemical effects on health is daunting due to the differing degrees and dimensions of exposure that can occur throughout the life cycle. There may also be variations in the ability to absorb chemicals (children absorb lead twice as fast as adults); and in the susceptibility to damage (greater vulnerability of the fetus to many toxic and mutagenic compounds) (IOM, 1998). For these reasons concentrated research on chemical exposures is needed.

Endocrine disruptors and reproductive health

The role of biology in environmental health risk can be more specifically demonstrated through the current widespread attention to endocrine disruptors. These are exogenous chemicals which either "mimic" or "antagonize" the action of endogenous hormones in the human body. Research focuses particularly on processes or tissues affected by estrogens, androgen blocker and thyroid hormones. Sex steroids specifically affect the central nervous system, the immune system, and the reproductive systems, while thyroid hormones affect most tissues in the human body (Bigsby et al, 1999).

A gender finding of interest in connection with environmental estrogens is that women are more susceptible than men to autoimmune conditions. Women's heightened immune response to both foreign and self-antigens appears to account for their greater preponderance of autoimmune disease (Ansar Ahmed et. al, 1999). Quite a few hazardous substances bio-accumulate in adipose tissue, which women typically possess more than men do. Differences in biological susceptibility also threaten men, as shown by the increase in male reproductive cancers, and the decline of male fertility (Colborn et al, 1996, Butter, 1999a).

Interactions between toxic substances and pathogens

Toxic substances, like many other physiological and mental stressors, impair the immune response. There is some evidence that dioxin speeds up the disease process in HIV/ AIDS patients, as does zinc deficiency (Mbakaya, 1999). Fundamental research into interaction between dioxin and virus infection with regard to detoxifying system, immune system and blood-brain barrier to toxic substances reveals, that dioxin accumulation and virus susceptibility are mutually enhancing. Mechanisms involved are so general, that there is no hope that the effects are species, virus or substance-specific (Funseth 1999).

Typically, much less is known about the effect of environmental androgens on human health. A common contaminant is the organotin compound TBT (tributyltin), which is used as

antifouling agent in ship's paint. It induces masculinization in marine animals and there is every reason to expect similar effects on humans (pers. comm. Cato ten Hallers-Tjabbes.). Exposed groups to organotin compounds include harbor workers, but also farmers and their families as organotin compounds are common ingredients in fungicides.

Most concern however, is about prenatal exposure to endocrine disruptors, as many of these substances pass freely through the placenta, exposing and adversely affecting fetal development. It is estimated that background concentrations of dioxins and PCBs in industrialized areas in North America and Western Europe account for subtle congenital disorders such as hyperactivity and lowered IQ in 10% of the newborn (Koppe, 1995, Koppe et al., 1999, Patandin, 1999). Other effects include low birth weight, vitamin K deficiency, hypospadia (congenital malformations of the penis), spina bifida and nuerological disorders due to exposure *in utero* (Koppe et al., 1999). As for effects on adults, TCDD (tetrachlorodibenzo-p-dioxin) is designated by WHO as a known human carcinogen, and several less potent dioxins as "probable" human carcinogens, although the precise causal mechanisms remain poorly understood (WECF, 1999, Colborn et al, 1996).

DDT and related compounds

Breastmilk analysis has become an increasingly common method to monitor body burdens of persistent contaminants. Since many of these substances enter the body through the food chain, it is taken to reflect the background levels of contamination. Breastmilk contamination, particularly in poor populations, is of concern as it may decrease willingness to breastfeed and lead to increased birth rates and infant mortality (Hooper et al, 1999). It is still unclear at what levels of pollution the advantages of contaminated breastmilk are outweighed by its risks. Any such evaluation would also compare the hygienic conditions affecting the risks of formula feeding. In general breastfeeding is still considered best (Patandin, 1999, Lanting 1999, Hooper et al., 1999).

DDT and PCBs in breastmilk is reported to be associated with decreased lactation periods and lesser ability to breastfeed (Commonweal, 1999, Gladenn and Rogan, 1995, Lanting 1999). DDT was phased out in most countries, but stocks of old pesticides form a hazard in all regions. It is still used for pest control in some countries in Latin America, Africa, and Asia, but nobody knows to what extent. Related compounds as chlordane are widely used to control termites (UNEP, 1999). High levels of DDT were reported from rural areas in Venezuela and Sudan (Brunetto et al, 1996, Taha, 1993) and rural/urban areas in Uganda and Zimbabwe (Ejobi et al, 1998, Chikuni et al, 1991).

In general DDT breastmilk levels from countries applying DDT are higher than the WHO-standard but it is not too clear from what source, as DDT contamination can occur through the food chain rather than from direct exposure. The presence of DDT was found in breast milk of women from an isolated Papua community, where DDT never has been sprayed (Spice and Kereu, 1993). Similarly, high levels of persistent organic pollutants (POPs) have been found in the Arctic food chain. Although they have never been used there, these compounds have settled in the Arctic due to atmospheric transport. Inuit women report increased incidence of cancers by eating fish and game from the region (IEN/ Greenpeace, 1999). However in Uganda, urban women had significantly higher breastmilk levels than rural women, but DDT-levels did not relate to vegetarian or non-vegetarian diet, indicating that in this case the food chain was not the primary route of exposure (Ejobi et al, 1998).

Environmental Disasters

Fears about breastfeeding and the safety of the food chain greatly added to the trauma of affected populations in Eastern Europe following the Chernobyl nuclear disaster of 1986. It has been estimated that the psychosocial dimensions of the Chernobyl disaster far outweighed the physical disease manifestations for many years afterwards (WHO, 1990; UNESCO, 1996). Women are also

disproportionately physically affected in such a situation due to their higher susceptibility to iodine deficiencies and goiter, which can lead to increased uptake of radioactive isotopes (IOM, 1999).

A less publicized but no less extensive environmental catastrophe has been taking place for over 20 years around the Aral Sea, which has shrunk to almost half its original size. Intensive cotton cultivation involving aerial spraying, diversion of feeder rivers for massive irrigation schemes, soil salinization, mineralization and heavy erosion created a series of environmental, health, and social problems from which the region, covering areas of five Central Asian countries, is unlikely to recover. Significant destruction of livelihoods occurred, followed by massive impoverishment and outmigration and the weakening of family and social networks (Kiessling, 1999).

Breastmilk monitoring in southern Kazakhstan revealed levels of dioxin-like compounds ten times higher than those found in the United States. The levels of concentrations of TCDD (tetrachlorodibenzo-p-dioxin) in the Kazakh women's breastmilk resembled those found in populations exposed to industrial accidents (Hooper et al, 1999). The data suggest that exposure to these compounds is chronic, environmental and long-term. Cotton defoliants are a likely origin of exposure, with the most likely pathway being contaminated foodstuffs. Similar findings have been reported from Karakalpakstan and Uzbekistan (WECF, 2000).

At a more general level, when dealing with environmental hardships men have some definite advantages over women. In the case of natural disasters and seasonal hardships, disaster statistics habitually record more female victims than males. Apart from differences in physical strength, social norms restrict women's freedom and independence of movement, which affect their willingness to leave homes and possessions in times of risk.

5. Gender Inequalities Related to Societal Differences

Indoor Air Pollution

Indoor air pollution is described as the last major unaddressed public health problem and cooking with biomass as "possibly the greatest occupational hazard faced by poor women" (WHO, 1984). There are significant questions linked to exposure to biomass or coal smoke, nutrition, and pregnancy that remain to be researched. Depending on the type of housing, fuel, stove, ventilation, and cooking patterns, exposure to the particulates and gases found in biomass and coal smoke can be very high. The issue can be further compounded through exposure to environmental tobacco smoke. Research in China established that the risk ratio for respiratory symptoms linked to the use of coal as a cooking fuel increased in the presence of environmental tobacco smoke (Pope & Xu, 1993).

It is suggested that exposure to air pollutants hinders uptake of essential nutrients (Kamat & Deshi, 1987). High prevalence of chronic bronchitis in women in developing countries is associated with exposure to indoor smoke from cooking. A complication of bronchitis in *Cor pulmonale*, or right-sided heart failure, associated at an uncommonly early age in women with long-term exposure to domestic smoke, particularly in high, cold regions. As women with these conditions are not treated or hospitalized, official statistics still report those mainly affected by chronic lung diseases to be male (Sims, 1994) Pioneering research in India also strongly suggests that use of biomass fuels for cooking substantially increases the risk of active tuberculosis, particularly in rural areas (Mishra et al, 1997). Armenian women report, that due to prolonged fuel scarcity many urban dwellers took to the burning of municipal waste for cooking and house heating. Burning of plastic, bleached paper, preserved wood and many other modern types of household waste exposed them to heavy loads of dioxin-like substances, PAH and heavy metals (WECF, 2000).

Cooking with biomass fuel or coal generates multiple risks and exposures, which form an intergenerational vicious circle. The health risks to women and infants dependent on low-grade fuel for cooking and heating can be characterized as follows (Smith, 1987, WHO, 1992):

- gathering and transporting fuel (time and energy costs, musculoskeletal disorders, falls and fractures, increased risk of prolapsed uterus)
- smoke from biomass/coal burning (respiratory disease, eventually heart disease)
- eye infections and disorders (conjunctivitis, cataract)
- depressed immune response from smoke exposure
- exposure of fetus to CO (affects fetal development and birthweight)
- LBW infant vulnerability to infectious disease
- risk of stunting for infant

Water

Access to and control over environmental resources is of vital importance to those dependent on it. Water scarcity for a large part is human-made, as many irrigation-projects have specifically targeted the larger landholders, assuming 'trickle-down' effects to the poor that never came to pass. Typically women are not acknowledged as stakeholders in irrigation, despite lifelong user rights to land and a willingness to invest in land improvement. Falling groundwater tables in India allow those in possession of more expensive equipment, or deep tubewells to keep on extracting water. Meanwhile those with shallow wells and handpumps, who are more likely to be women, face water shortage with adverse effects on nutritional status, income and workloads (World Water Council, 2000). Those who lack good public infrastructure, like many poor urban women, have to pay exorbitant prices to the water sellers.

More than a billion people are currently deprived of water of sufficient quantity and quality to meet even minimal levels of health and well-being. Absolute water scarcity is increasing in many parts of the world, making equitable access a pressing issue (World Water Council, 2000). Severe water shortage is predicted for 2.7 billion people, a third of the world population, in the first quarter of this century. In sub-Sahara Africa, this has been caused mainly by ecologically or socially mismatched infrastructural investments, while in Asia over pumping with cheap equipment has led to a dire trade off between food security and water security. In both cases the poor and women are most heavily impacted (IWMI, 1999).

Pesticides

Severe underreporting and lack of research of women's environment-related health problems also relate to power differences. PAN (Pesticide Action Network) Asia and Pacific carried out case studies in eight countries and found that more than 90% of the women involved regularly spray pesticides without adequate protection and know-how. Due to the lack of available childcare, women use pesticides often while carrying a baby on their back. All of them are exposed during weeding, cleaning equipment and clothing, and disposal of leftovers. Many of them cannot read labels or don't follow instructions. Highly toxic pesticides such as parathion, endosulfan, phorate, monocrotophos and phosphamidon were used frequently. Most women reported symptoms of intoxication, which as a rule go untreated (RENGAM, 1994). In Sudan, a consistent and significant association between pesticide exposure and perinatal mortality was found, with a 50% higher risk in rural women (Taha and Gray, 1999).

Lack of adequate legislation, ignorance of standards, poor labeling, illiteracy and lack of protective clothing increase the hazards to agricultural workers and environment (Maroni et al., 1999, Ndoye 1998, Yousefi, 1999, Partanen et al, 1999). While men receive some instructions for pesticide use, no information is given to women. Women buy pesticides at markets that have been repackaged from large containers into smaller containers, frequently lacking labels or instructions for use. Pesticides are transported and stored together with food products and containers are frequently re-used to pack food

products for the market. (Sow, 1994). Consumption of small-scale sector products is risky, because of pesticide residues as well as mycotoxins from poor storage (Loewenson, 1995).

Worldwide prevalence of acute pesticide poisoning is estimated at 1-3 million, resulting in 220.000 deaths per year, the majority of which occur in the Third World. These figures are probably inaccurate as under reporting is a major problem (Maroni et al, 1999). Intensification of monitoring pesticide poisoning in South Africa resulted in a tenfold increase in the cases reported and a completely inverted picture of the gender profile of poisonings. Routine surveillance suggested that 66% of poisonings involved men, but intensified surveillance found 66% of poisonings in women (London, 1999, London and Bailie, 1998).

Mycotoxins in Food

Mycotoxins are suspected or proven carcinogens, produced by molds that commonly occur in non-optimally stored dried food items, such as grains, copra and peanuts. The most important mycotoxins in staple foods are ochratoxin, fumonisins, zearelone and aflatoxins. They have been associated with esophageal cancer, urinary tract and liver cancers. They are a factor 1000 more potent than most synthetic carcinogens found in food, and constitute but one of the many threats to food safety in the developing world (Miller, 1996)

A crucial environmental health problem in developing countries is the use of highly toxic substances that are restricted or banned in industrial countries. Products are used continuously throughout the year, instead of 4-6 months per year in temperate climates. Moreover winters kill many crop pests, leading to lower disease pressure in the temperate zone. Obsolete pesticide stocks are problematic in most regions, but especially so in the South which lacks appropriate disposal methods (UNEP, 1999). The costs of safe disposal amount to $1000-2000 per ton excluding transport, hardly affordable for most developing countries (PANAP, 1998).

Ergonomics

Along with chemical and microbiological exposure in domestic, agricultural, and occupational settings, ergonomic problems are a further category of environmental health hazard for both men and women. Traditionally linked exclusively with occupational health in the formal sector, understanding that ergonomic problems pose health risks in a broader range of settings is growing. Much of this increased awareness is derived from gender debates as well as from more comprehensive definitions of the nature of work.

In the traditional view, men were seen as the main victims of occupational hazards and serious injury. More recently it is being recognized that women suffer many chronic, often undiagnosed and untreated occupational health problems. These include cumulative trauma disorders and specific musculoskeletal disorders in the supposedly "safe" jobs ascribed to them as women's work in both formal and informal sectors. Women's work on conveyer belts, in electronics plants, garment and textile factories, hospitals, and piece-working at home involve speed, repetitive motions and restricted positions. All of these conditions tend to produce these disease patterns which are rarely recognized or compensated in equal proportions to male disability (Punnett et al, 1987; Brisson et al, 1989; Brabant, 1992; Bru, 1994).

In recent years, research has called attention to the design and use of equipment, tools, workstations and protective clothing that are inadequate or unsuitable for the users' size and strength. Men are affected mainly when equipment, tools or clothing are imported by foreign-owned enterprises, but women are further disadvantaged as most equipment remains designed around male norms. Failure to take these issues into account results in work inefficiency, accidents, additional energy expenditure, and cumulative trauma in working women (Abeyesekera et al, 1988; Worksafe 1990; Chavalitsakulchai et al, 1993; Morse et al, 1993).

Rural women's domestic or agricultural tasks often require prolonged work in stooping or squatting positions, or regular weight bearing. Little research has been done on musculoskeletal disorders in women from these causes, although it has been shown that work in awkward positions reduces lifting power and requires greater energy expenditure (Gallagher, 1991). Kitchen work is also responsible for extended periods of time spent in stooped and uncomfortable postures (Nystrom, 1995), which in conjunction with agricultural tasks may result in several hours daily spent in ergonomically unhealthy postures.

The need for attention to multiple exposures is underlined through a Swedish study on the impact of heavy lifting on birthweight. It found that lifting alone had no negative effect, but in conjunction with other risk factors, for example chemical exposure, heavy lifting could influence pregnancy outcome (Ahlborg et al, 1990). A study on fractures in Indian women found that most were the result of work-related accidents and could be traced to a combination of prolonged unnatural work postures, nutritional deprivation and repeated childbearing (World Bank, 1995). Studies performed in the Gambia and Ethiopia on women's workload and weight-gain during pregnancy found that only half the amount of weight-gain took place in peak agricultural season compared to the low season. It was established that birth weight could be affected by changes in work conditions right up to delivery and that high work intensity was a factor involved in premature delivery. Lower survival rates were detected among infants whose mothers operated heavy farm tools while pregnant (Holmboe-Ottesen et al, 1988).

6. Challenges for Research

Environmental epidemiology is notoriously difficult. Responses to hazardous substances are often non-specific and there may be long delays between exposure and effect. In addition, many pollutants are so widespread that it is hard to find a control group. Consequently, epidemiology has yet to demonstrate clear and consistent associations between hazardous substances and health damage (Moeller, 1997). An alternative that is usually preferred is risk assessment, which relies on toxicological data, exposure assessment and dose-response extrapolations (Zakrzewski, 1997). However, both environmental epidemiology and risk assessment are criticized by community groups. The former for its inability to produce results and the latter for its heavy reliance on assumptions and fragmented, hazard-per-hazard approach (Butter, 1999b).

Other research approaches include Community Health Diagnoses and self-assessment by citizens. Community Health Diagnoses study environmental health effects at the community level and includes testing blood and urine of community members in the most contaminated areas. This reveals possible biological markers of exposition, in other words the degree to which their body has taken up contaminants (Bertell, 1999). Community health surveys either by health professionals or by community members themselves form cheaper alternatives to physical examinations. Self-assessment, as practiced in the Netherlands, is another possible tool designed for providing early warning to public authorities. It involves scrupulous and consistent registration by volunteers of both health complaints and environmental circumstances, using a carefully designed questionnaire. Registrations are saved in a national database that can reveal previously unnoticed patterns of morbidity related to specific environmental sources (Butter, 1999b). The questionnaire used, has raised interest among environmental NGOs from S.E. Asia as well as Africa.

A more integrated research approach to environmental and occupational health issues is needed. At present, the literature presents fragmented and decontextualized information. A review of eighty articles on back disorders, for example, showed that no data on exposure were given in over half of them, while in others such data was incomplete (Burdorf, 1992). A study of garment workers in Quebec found that only part of the substantial force exerted during an average working day was possible to measure with current

technology (Vezina, 1992). Measurement methods must take all aspects of exposure into account and they must fully describe exposure settings if appropriate interventions are to be designed (IOM, 1998:30).

Towards an integrated exposure assessment
Research on environmental exposures should include nutritional, ergonomic, and behavioral factors in addition to physical, chemical, and pathological agents. As a minimum, exposure measures should take into account the following:

* physical agents (noise, temperature, vibration, radiation, pressure)
* pathogens
* nutrition (calorie intake, vitamin intake, fat ratio)
* biomechanical (sustained awkward positions, frequent repetitive movements, force, lifting)
* psychosocial factors (stress, levels of control, social support)
* behavioural factors (substance abuse, smoking, weight fluctuation (IOM, 1998).

There is much polemic over the role of research in policy-creation and decision-making. In this case, the range is so vast and the problems encountered so complex, that research needs to be carefully targeted and focused to respond to both the needs of the largest numbers affected by health and environment problems, and to the gender equity needs so clearly demonstrated in the health and environment area. This is far from easy, as the current dearth of data, methods, and linkages shows.

Clearly, a different kind of research is needed to bring about the kind of knowledge to take gender, health and environment issues further. The limitations of epidemiology in capturing all the required determinants of health should be underlined. The creation of more gender-sensitive, participatory, and pro-poor approaches to research should be encouraged. Multidisciplinary and applied research is needed to give the necessary attention to social factors, exposure settings, and general context.

The integration of qualitative and quantitative methods is critical to effective macro-micro linkages. These linkages are essential to overcome the limitations of small project approaches, which cannot inform policy, and of policy creation based on research that is devoid of local context and realities. Contextual research of this nature should be continuously reviewed in relation to the findings of basic research. In this way a more comprehensive understanding can be reached, for example, of risks that are synergistic and/ or cumulative. From such an understanding appropriate preventive and health-promotion strategies can be devised and implemented.

The limited current success in including gender criteria or perspectives in health and environment planning, or indeed the planning of any other sector, calls for new methodological approaches. There is a need to help planners and decision-makers conceptualize complex health and environment issues in a way which clearly demonstrates the gender dimensions. Rapid, preferably low cost, environmental health assessment tools on community level are urgently needed.

Incorporating gender dimensions into tools such as Health Impact Assessment (HIA) and Environmental Health Impact Assessment (EHIA) is proposed but rarely acted upon. This is partly because such tools themselves are not yet regularly used as part of decision-making, although a number of European countries are now paying more attention to institutionally relevant HIA systems (Lehto & Ritsatakis, 1999). If HIA were conducted from a gender perspective and its use promoted on a widespread basis, this would be an important step forward and would facilitate the establishment of gender-sensitive health and social indicators in cultural context.

7. Obstacles to Policy Implementation

Integrating health and gender as dimensions to environment issues is a major challenge. Currently, mainstream environmental decision-making is rather gender blind, despite persistent effort from women's environmental NGOs. A case in point is the last INC3 (Intergovernmental Negotiating Committee)

UNEP Conference on the phasing out of POPs (persistent organic pollutants). Gender issues are not addressed by the draft document undernegotiation (UNEP, 1999), even though women's NGOs are campaigning for the recognition of hazards posed by POPs to reproductive health (Guillette, 1994, WECF, 1999, WEDO 1999). At the same time, environmental threats to public health hardly figure on the population and health agenda. Despite commitment in the Cairo ICPD Platform of Action to address the broader determinants of population health, including environmental constraints, the ICPD+5 was not able to address this larger agenda (De la Rosa, 1999, UNGASS, 1999).

Yet given the strength and ubiquity of gender and environment linkages globally, there is a strong case to be made for institutional recognition of the need to link gender equality with broad health and environment issues. This was underlined in the OECD/DAC's work on Gender Equality and Environment (OECD, 1999). In general, this review found the formal integration of gender equality issues into environment, environmental health, or environmentally sustainable development policies to be weak, or to take a largely instrumental view of women's input. No participating donor agency possessed a policy that explicitly linked gender and environment issues as essential and complementary goals for development cooperation.

Possible Outcomes of "Gendered" Health-and-Environment Work

What would be the difference if greater gender equity in health and environment work at national level were achieved? The following are just a few examples among infinite possibilities:

- a clear understanding of the different policy implications of gender-blind and gender-sensitive data and information, more accurate determination of the burden of disease and ill-health for men and women respectively from environmental causes and factors, gender criteria included in assessment tools such as HIA and EHIA, and strengthening of linkages with social impact assessment, more equitable distribution of national resources through gender-aware macroeconomic policy
- greater effort by the health sector to take health care services to women, particularly in remote rural areas
- research and technology oriented towards alleviating heavy manual work performed by poor rural women
- public and private sector collaboration in seeking responses to public spending cuts which do not disadvantage women
- promotion of rural economic growth strategies benefiting both men and women
- public and private sector collaboration in establishing effective environmental and occupational standards and regulations to improve working conditions for men and women.

A policy document outlining clear linkages between gender equality and other sectoral issues can be critical for work at the national planning level, and can serve to support other national gender commitments which often prove difficult to implement in isolation. Understanding the linkages is critical if current gaps between international instruments and national action are to be bridged. This will be an important step to take to assist countries in overcoming the difficulties they are currently experiencing in implementing the recommendations to which they made commitments at the major summits of the last decade.

The OECD/DAC review also stressed the importance of donor agency commitment to gender equality as a crosscutting theme. Unless gender equality is prioritized further resources for implementation are unlikely to become available. This is important as there is a consistent tendency for gender equality policies and programs to be under-resourced (OECD, 1999). This is hardly surprising when donor countries' domestic environmental policies typically lack a gender perspective (WECF, 2000).

Among the numerous obstacles to meaningful integration of gender perspectives into environmental health policy, the following are perhaps the most significant:

Fragmentation: There are multiple policies originating in multiple ministries and government departments spanning the range of environmental health issues. Ministries of environment, natural resources, agriculture, mines and energy, construction, labor, and planning will all be involved in different ways in health and environment issues. Typical examples are water and forestry, where responsibilities may be

fragmented among a number of branches that do not necessarily interact or take common decisions. This pattern is mirrored in universities and research institutions that similarly fragment environmental health issues among different faculties and departments, hindering the acquisition of an integrated and synergistic understanding of the problem.

Vacuums: A major shortcoming of national policy is that it frequently fails to reach out or down, to those most in need. In developing countries, most rural and many urban slum and peripheral dwellers, live beyond the scope of official policy and services. Examples are energy, transport, and health. The economic and opportunity costs to poor families of making good these shortfalls through private or illegal services, or personal energy output, are high. Macroeconomic policy has reinforced this trend through structural adjustment programs in developing countries by severely reducing social spending. Household coping strategies that are culturally biased can further discriminate against women who are responsible for the provision of household needs even in the absence of basic services.

Conflict: When gender policy is officially adopted at the national level, it is may not always compatible with existing policy in other sectors. This significantly reduces the chance that it will be successfully implemented. An example of this might be alterations in trading patterns for coal. If a country promotes the internal use of coal supplies for household use instead of exporting it, this can conflict with health sector recommendations to promote cleaner fuels. Likewise, gender policy may actively promote equal employment opportunities for women by removing legal barriers and promoting macroeconomic growth. But there may be labor rules that prevent women to work in nightshifts, limited transport facilities, or inaccessible skills training, which constrain women's ability to take advantage of these new opportunities.

Enforcement: Although environmental standards and regulations pertaining to air, water, food, vehicle emissions, labor, and related matters can be better enforced in developed countries, this is more difficult in the developing world where such standards often do not exist and if they do, enforcement mechanisms are lacking. While women and men alike are at risk from this lack of regulation, women may be further disadvantaged as gender-sensitive methods are not yet used for establishing standards, which are therefore set at male dose-response levels. This can be seen in air pollution standards that fail to reflect the additional indoor pollution to which most populations in developing countries and particularly women and infants are exposed to.

Capacity: To carry out appropriate policy-making and the research that underpins it, adequate capacity in environmental health management, planning and epidemiology are needed. The developing world is again at a disadvantage, as capacity in the area of environmental health is still dominated by sanitarians and sanitary engineers, most of whom are men. Additionally, gender issues are conceptually remote from the areas of work traditionally covered by environmental health practitioners. The human resource capacity, to draw together gender, health and environment issues at policy and planning level is largely deficient.

8. The Way Forward

Given the tendency for environmental issues to be dichotomized with economic growth and progress it is critical for health and environment planning to work in coordination with macroeconomic policy. Working to integrate them may in some cases assist in maintaining state control of industrial and economic policy that can be weakened by globalization. Recent international initiatives aimed at including gender issues in macroeconomic policy will facilitate this task (UNRISD, 1997).

Harmonization and joint planning should be made an obligatory feature of national planning, in the recognition that health- and-environment problems are neither caused nor solved by any single sector or

approach. Effective harmonization of policy must include gender mainstreaming policies. Consideration of gender issues should not be left until a late stage in planning when their inclusion may prove problematic. There is evidence that some countries are making this effort to move towards more integrated policy and planning approaches in health and environment (Von Schirnding, 1999).

Much of this progress is due to national and local commitment to Agenda 21 plans, which involve improved transparency and public participation in decision-making. An interesting initiative was taken by 52 countries in the UN/ECE region. Subsequent ministerial conferences on Environment and Health were held in Frankfurt (1989), Helsinki (1994) and London (1999). This led to the adoption of a European Health and Environment Action Plan, the development of national health and environment action plans (NEHAPs), and finally to the intention to develop local environment and health action plans (LEHAPs) (Butter, 1999b). A related regional initiative is the Aårhus Convention, granting public participation and access to information in environmental decision-making (UNECE, 1998). To date, only two states have ratified this Convention. Civil society organizations hope that these mechanisms will provide an opportunity for fuller participation in addressing environmental health issues (EcoForum, 2000).

Another example of integration, civil participation and gender-sensitivity is the National Water Act from 1998 in South Africa. It aims to ensure sustainable management of water resources, promote equitable access and redress past racial and gender discrimination. To this end, decentralized, multi-stakeholder, public management agencies were set up with far reaching powers for water allocation and licensing. Despite its intentions, the program has not sufficiently included women's participation, due to women's lack of organization and power. Capacity building is currently being encouraged by a new round of consultations among smallholders, building upon informal networks and NGOs (World Water Council, 2000).

NGOs have often been at the forefront of creating integrated projects. The women's NGO SEWA involved women in water management, first by consultations at the community level, subsequently by adequate interventions. This involved providing training for pump repair, which yielded additional income generating activities, or constructing roof water tanks, or caves for water storage, depending on the local situation (SEWA, 2000).

Another integrated framework currently used by a number of both developed and developing countries to promote better health at all socioeconomic levels, and to integrate environment, health and development concerns, is the "healthy settings" approach. This can, with appropriate care to avoid an instrumentalist approach to women, be easily used for incorporating gender perspectives into health and environment work. Better defined as social movements or processes rather than specific projects, the activities undertaken are selected by a wide range of stakeholders from the public and private sectors. The best known is the Healthy Cities movement (Ashton, 1992). Over the last decade numerous other "settings" approaches have been built up, such as Healthy Schools, Markets, Hospitals, Homes, and Workplaces. In recent years, some developing countries and small island states have started Healthy Villages and Healthy Islands approaches. All are useful platforms for advancing gender, health and environment concerns. The "settings" approach, applied with appropriate gender criteria, could fill many current data and contextual gaps, helping to bridge the persistent gap between the requirements of international instruments and effective policy and strategy at country level.

Whatever the origin of environmental risks and constraints, the place where the impact is most keenly felt is at the individual and household level - where no artificial separation of sectors and policies exists, but where the end-results of policy vacuums, conflicts, and problem are most evident. It is in local environments that exposure to environmental, lifestyle and social hazards combine to determine health.

Given the strong dependence on local resources of the world's poor, a strong focus on the local level and a participatory approach to health, development and policy-making is indispensable.

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